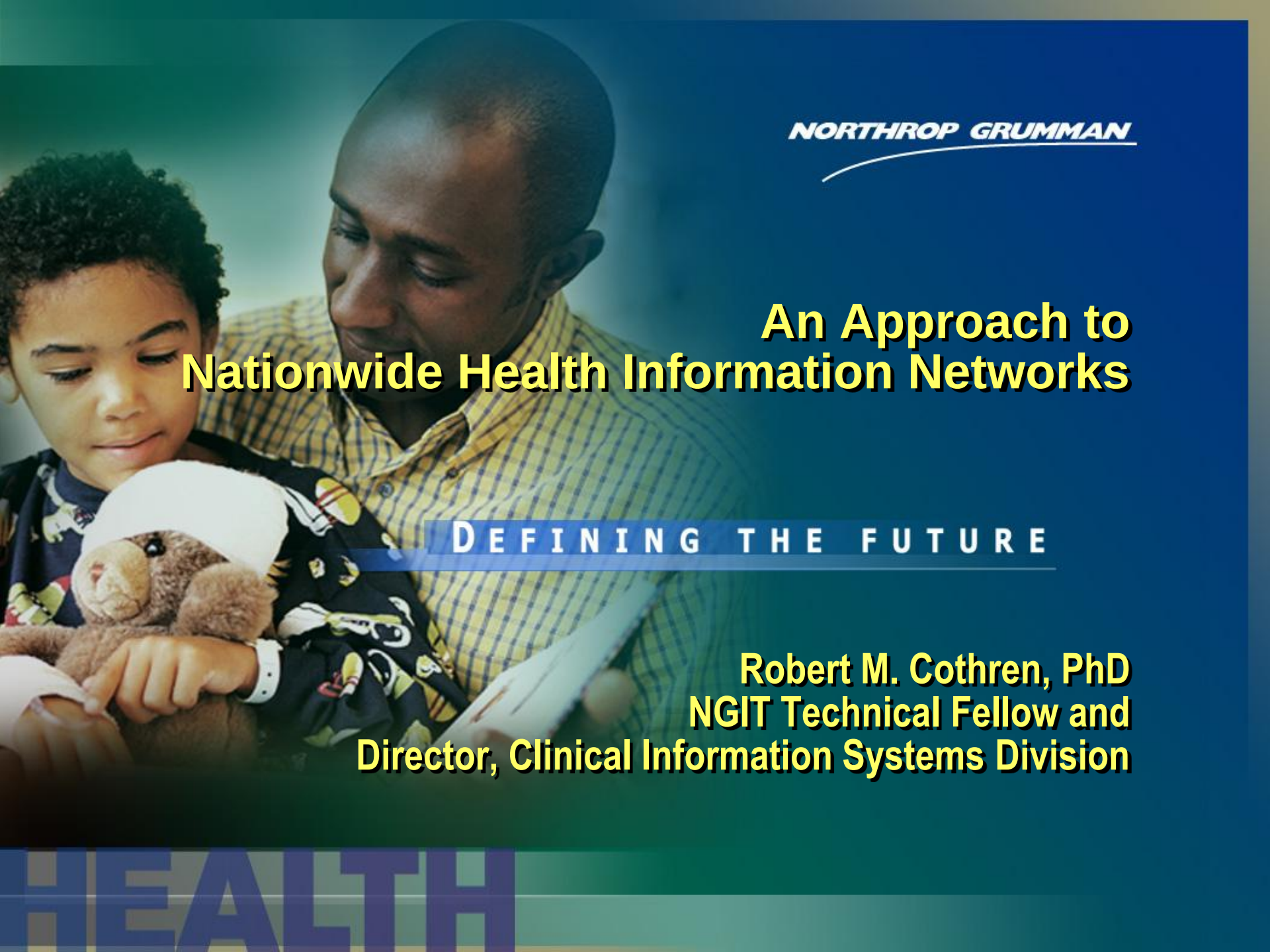
NORTHROP GRUMMAN
An Approach to
Nationwide Health Information Networks
DEFINING THE FUTURE
Robert M. Cothren, PhD
NGIT Technical Fellow and
Director, Clinical Information Systems Division
HEALTH

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About Northrop Grumman Health Solutions

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DEFINING THE FUTURE

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Practice Areas

Clinical Information Systems

Informing Clinical Practice
Interconnecting Clinicians
Personalizing Care
Improving Population Health

- 11 MDs, 15 total clinicians
- EHR services for 16 .5M DoD / VA patients
- HIT exchange for 172 VA medical centers

Healthcare Systems Management

Modernizing Benefit Management
Promoting Quality Performance
Supporting Information Flow

- 1,000+ IT / informatics professionals
- Second largest IT contractor to HHS

Public Health

Epidemiology & Biostatics
Emergency Preparedness & Response
Occupational & Environmental Health
Communications & Education

- 140+ Public Health professionals
- Largest IT contractor to CDC

Life Sciences

Managing Trials Information
Improving Post-Market Surveillance
Enabling Bioinformatics Solutions

- Largest bioinformatics contractor to NIH
- Over 1200 Pharma industry customers

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Practice Snapshot

Designed and developed the largest global, enterprise-wide electronic health record (EHR) in the world.

AHLTA for DoD
- >9M beneficiaries
- >7K physicians
- 81 facilities

Pioneered the only operational nationwide health information exchange in the US.

FHIE/BHIE for VA
- 170+ facilities
- >19M personnel

Support development and operation of the only national public health information exchange in the world.

PHIN for CDC
- prevention
- detection
- response

Contractor for the only civilian health information exchange initiative in the US.

NHIN for HHS
- e-health records for all Americans

Designed and developed a unique medical terminology / ontology translation service.

TSB for DoD
- semantic interoperability

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AHLTA (formerly CHCS-II)

Clinical Information System maintaining a comprehensive, life-long, computer-based electronic health record for ***over 9.4 million*** Military Health System beneficiaries.

Facilitates Documentation of the Electronic Medical Record

- 81 active facilities
- 221 locations including satellite clinics worldwide
- over 8000 providers actively on system
- over 48,000 encounters per day, increasing by 1,000-2,000 every month

In any given week, AHLTA supports

- 2.1 million prescriptions
- 1.8 million outpatient encounters
- 400,000 dental procedures
- 19,500 inpatient admissions
- 2,000 births

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Federal / Bi-directional Health Info. Exchange

Framework for exchange of patient-focused electronic health information among DoD an VA sites.

- Ensures compliance with HIPAA regulations and security requirements.
- Improves sharing of clinically relevant health information.
- Allows convergence of health information applications.
- Enables interoperable health records and data repositories.

Types of information exchanged.

- Medication History
- Allergies
- Lab Results and Pathology Reports
- Radiology Reports
- Discharge Summaries
- Deployment-related health surveys

170+ VA hospitals covering ***19 million*** current and former military personnel.

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Public Health Informatics

Public Health Information Network (PHIN)

The PHIN is a standardized framework that enables *consistent exchange* of health, disease tracking, and response data between public health partners.

phin
PUBLIC HEALTH INFORMATION NETWORK

Architecture Standard: based on logical and physical data model, public health directory, etc.

Messaging Standards: based on HL7, XML, and Web services (SOAP).

Data and Content Standards: based on SNOMED, LOINC.

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Terminology Services Bureau

Tools and services that enable semantic interoperability between entities.

A consistent model that addresses:

- the process of mapping terms/concepts,
- capturing their relationships with other terms/concepts, and
- extracting mappings for any client application using those terms/concepts.

Leverage health informatics expertise with automation toolset to create relational maps of entity terms/concepts to canonical models.

Translation of entity terms/concepts to canonical model via run-time services.

Scalable: within enterprise, among enterprises, RHIOs, nationwide exchanges.

Current content in MHS Ontology: SNOMED CT, MEDCIN, PKC, RxNORM, NDC.

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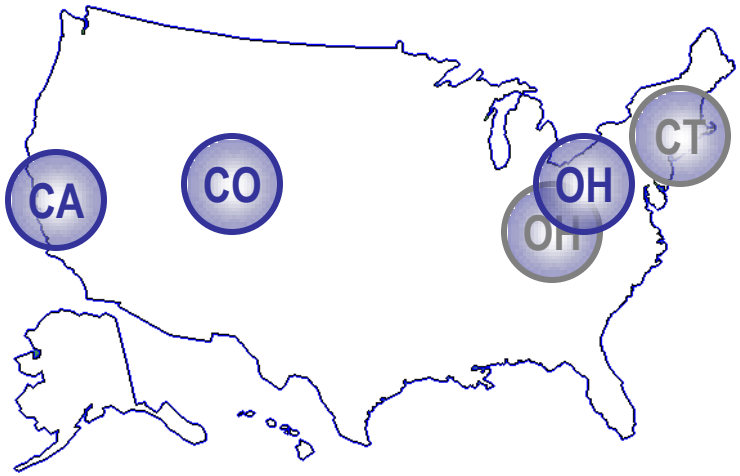
Nationwide Health Information Network

About Our NHIN Team

Our Health Care Partners

- Santa Cruz RHIO
- Greater Cleveland Metropolitan Area (UHHS, Cleveland Clinic, MetroHealth)
- Quality Health Network
- Greater Cincinnati HealthBridge
- Waterbury Health Access Program



Our Technology Team

First Consulting Group, Axolotl, RxHub, Client/Server Software Solutions, SphereCom Enterprises, Emdeon, Oracle, and Sun/SeeBeyond Technologies

Key Features of Our Health Care Partners

Varying Maturity

- Both well-established and forming health information communities.

Varying RHIO Technologies

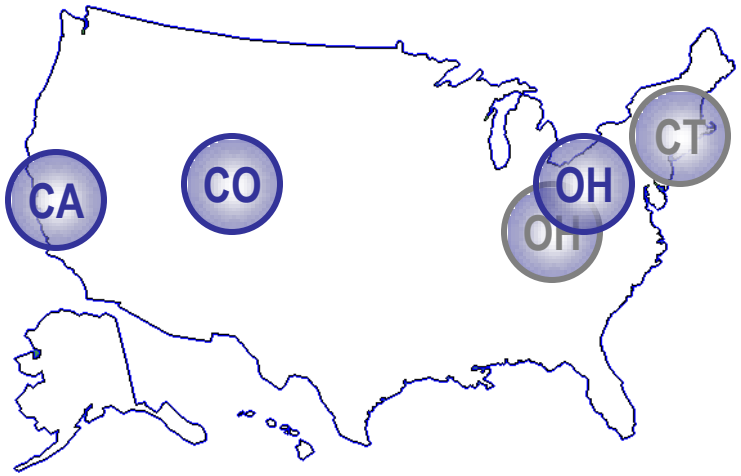
- Both clinical-messaging and consolidator RHIO approaches.

Varying RHIO Architectures

- Both distributed (federated) models and centralized repositories.

Varying Types of Systems

- Includes RHIOs, enterprise EHRs, and consumer-owned PHRs.



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Drivers for Our Design

Design Goals

Sustains Interoperability

1. Develop / enforce nationwide standards to facilitate interoperability.
2. Leverage success at local level and "lower the barrier" for entry.

Facilitates Adoption

Design Drivers

- Broad interoperability through leveraging existing information exchanges.
- No dependence on centralized nationwide services.
- Quality attributes: performance, security, scalability, extensibility.
- Flexibility of implementation.

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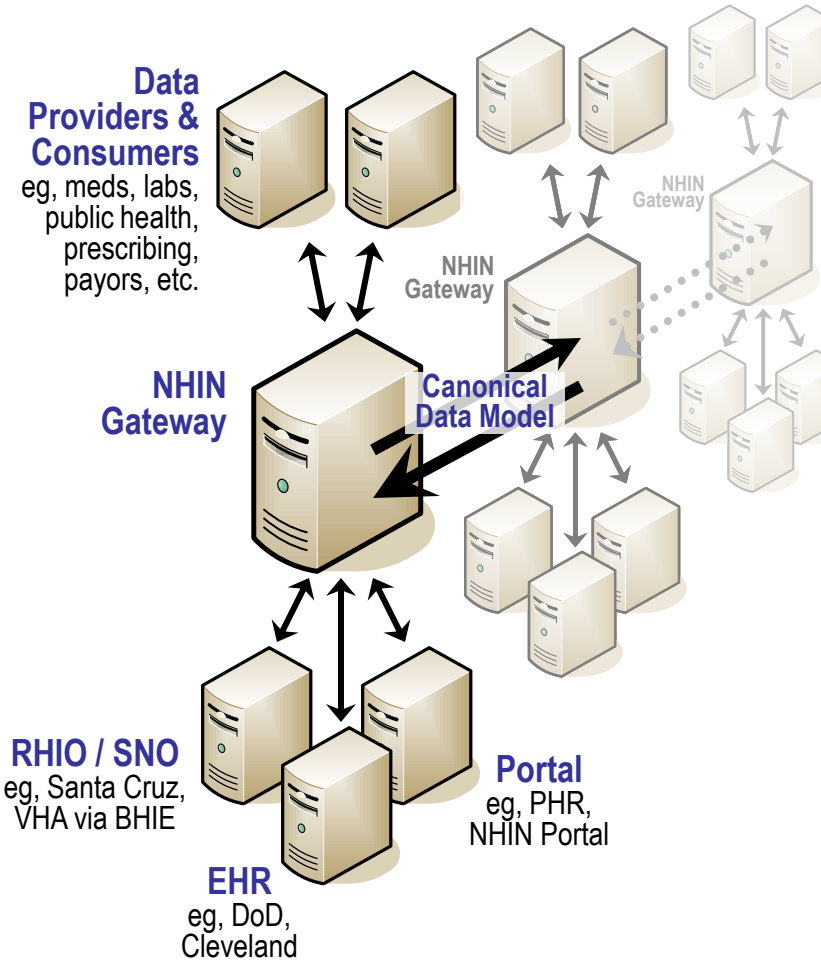
Our NHIN Architecture

Architectural Solution: Gateways

- Each entity connects through a gateway providing essential services needed for interoperability.
- Gateways interconnect using agreed-upon nationwide standards.
- Gateways provide translations for children not yet standard-compliant.
- No centralized master service is needed.

Demonstrated at the 3rd NHIN Forum, January 2007.

- Extended during February to include DoD and VA.



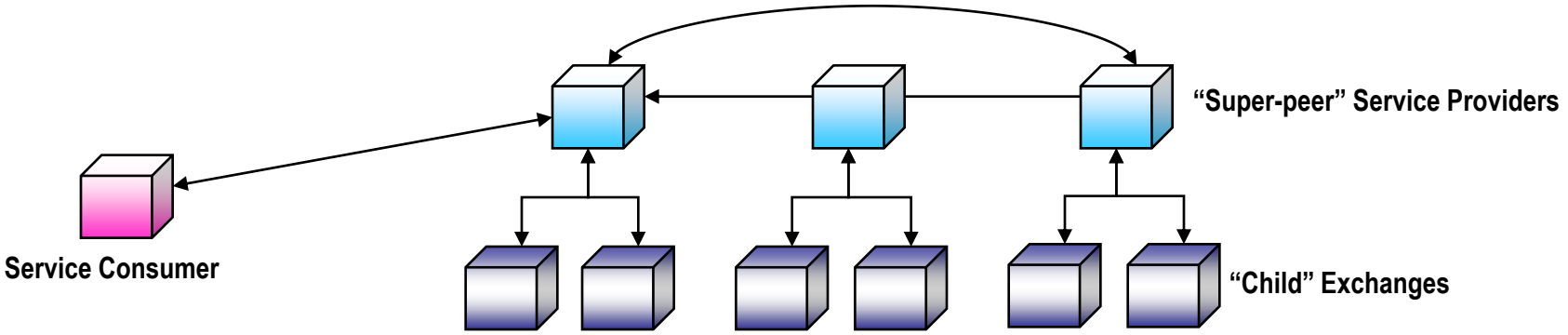
Super-peer Topology

Hierarchy stops below the master nationwide service.

Highest level of the hierarchy is composed of a number of "super-peers".

For patient ID example:

- Consumer queries a particular super-peer
- Super-peer can return identifiers within its children
- Super-peer will in turn query other super-peers in order to get other identifiers

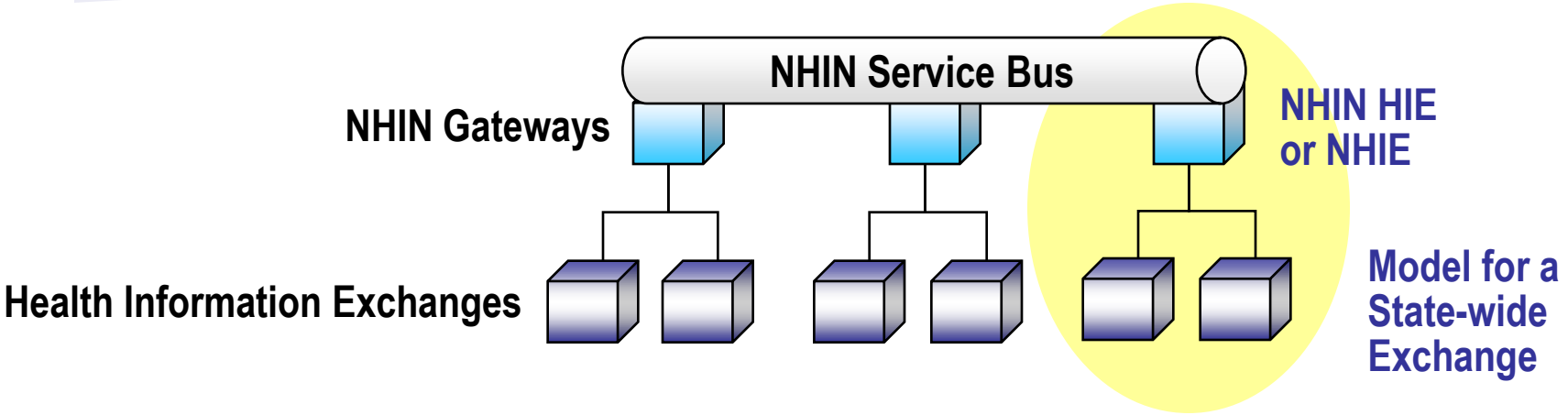


NHIN Service Bus

Features of an NHIN Service Bus (ESB):

- Distributed – does not require a central hub or engine
- Standards-based
- Supports message routing, transformation
- Enforces business rules
- Enables service composition

NHIN services, acting as inter-connector for their children and as "on-ramp" to the NHIN, are aggregated into NHIN Gateways.



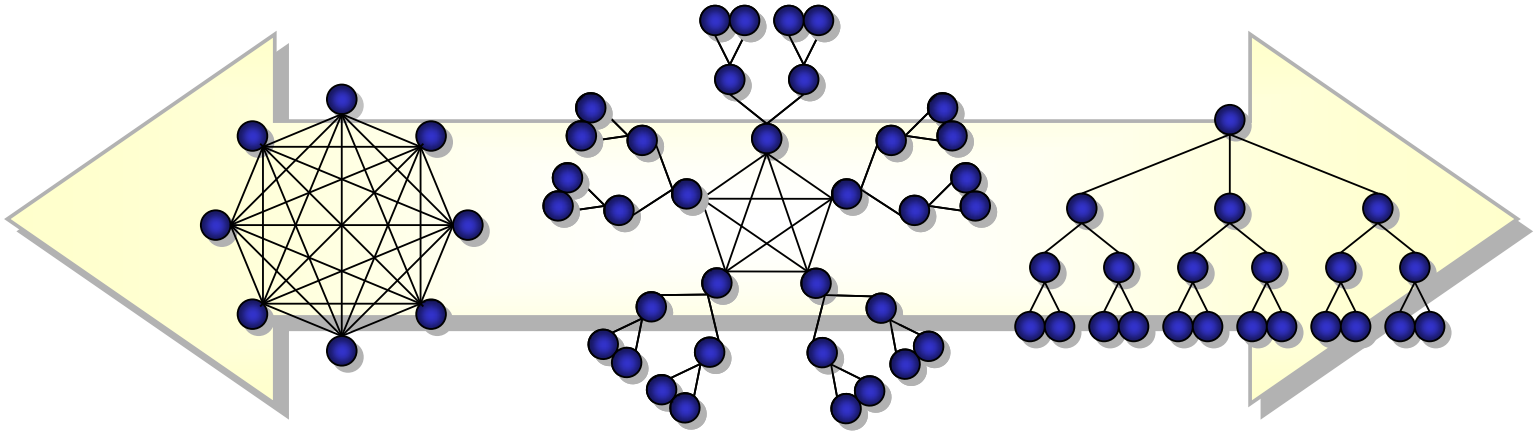
Why the Super-Peer Model?

Reduces complexity required of a peer-to-peer networks.

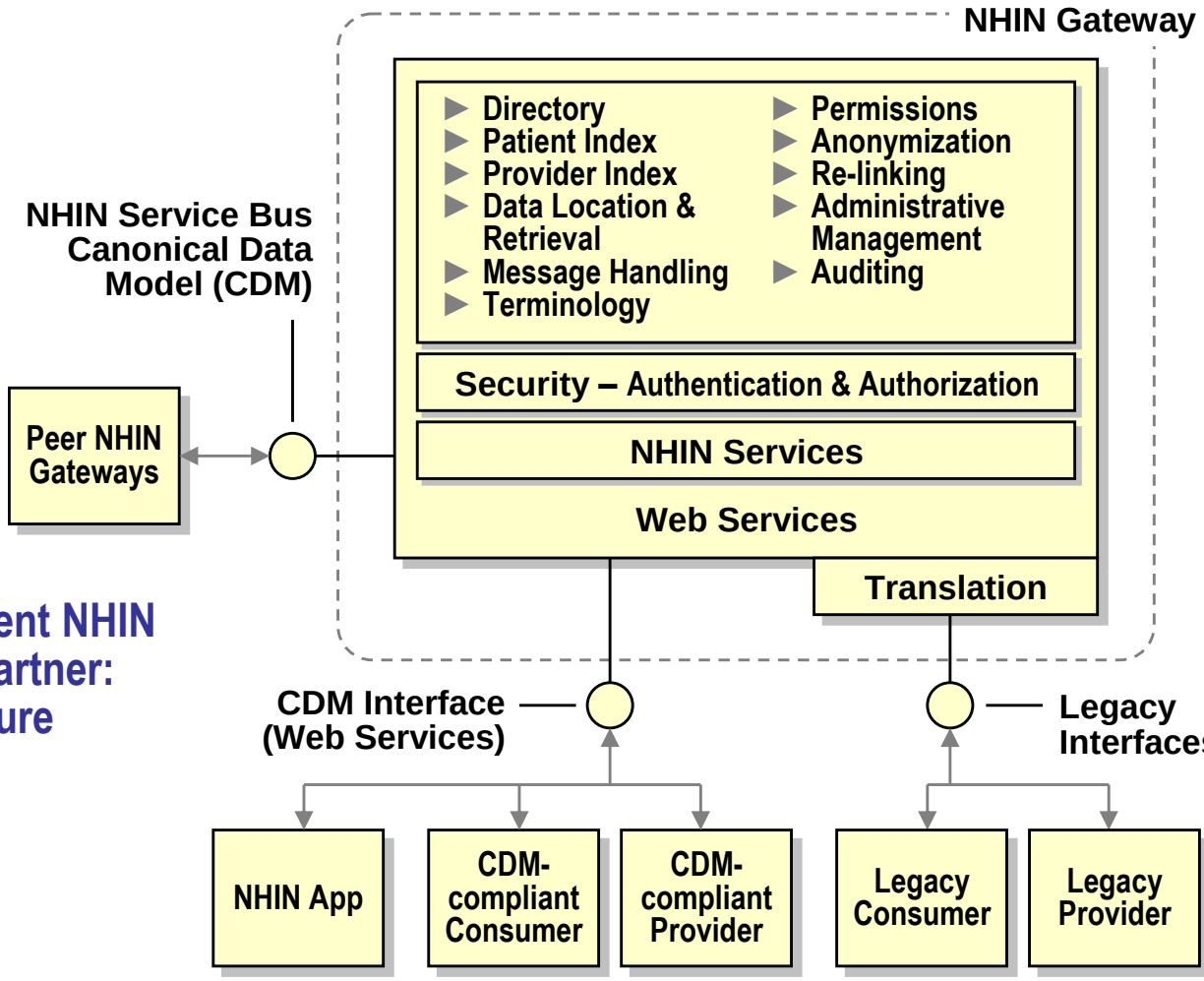
- Peers need to manage all connections and know about all participants on the network

Allows for decentralization versus a hierarchical network.

- Allows any large HIE (NHIN HIE) to participate as a peer.
- Allows aggregation of a state, large community, or non-geographical exchange organization.



NHIN Gateway Architecture and Services



Maps into recent NHIN report from Gartner:

- Architecture
- Services

Implementing IHE interface through translation

NHIN Architecture Framework

Architecture Overview

Problem Background

The need for interoperable health information available from multiple sources nationwide has been thoroughly documented.[1,2] Challenges to achieving this goal include lack of electronically captured information, fragmentation of data sources, lack of consensually accepted standards, concerns about loss of privacy, and differing policy and regulatory environments throughout different jurisdictions. A key component of the Department of Health and Human Services' (HHS) strategic framework for health information technology (HIT) is the development of a Nationwide Health Information Network (NHIN). Four consortia were contracted to separately study and design an optimal NHIN architecture, demonstrating its capabilities in three separate healthcare markets. This framework details the **Northrop Grumman Health Solutions NHIN Architecture** (NGNA).

Context, Goals, and Architectural Drivers

Functionally, the advisory body for HHS, the American Health Information Community (AHIC), identified a number of breakthrough areas, three of which have been expanded into detailed use cases that elaborate on the kinds of functions that would be supported by a NHIN.[3,4,5] In addition, the National Committee on Vital Health Statistics (NCVHS) provided a report to the HHS detailing a requirements framework for the initial definition of a NHIN.[6] Other than those functional requirements, however, the HHS has not provided any specific constraints on the desired architecture of a NHIN. We thus begin by outlining the goals, context, assumptions, and architectural drivers.

Using the AHIC use cases, the NCVHS NHIN requirements framework, and public comments by HHS leadership, some fundamental goals have been identified that drive the NGNA approach. These goals can be contextualized through the concept of a service. Throughout the nation, there are many entities (individuals and/or organizations) with healthcare information-related needs, and other entities with capabilities that can meet those needs. A service is defined as the means by which those who have needs (service consumers) are brought together with those who offer capabilities (service providers). Since the focus is on the HIT domain, the rest of this discussion pertains to services provided through hardware and software.

Achieve Broad Interoperability by Leveraging Existing Interoperability

A core objective for a NHIN is to enable any potential service consumer to be connected (directly or through intermediaries) to any potential service provider nationwide. Currently in the U.S., there are pockets of services that enable consumers and providers to connect electronically, usually via the Internet. These sets

1 The Common Framework, http://www.ConnectingForHealth.org (June 2006).
2 Resource Location and Updating Service (RLUS), http://hxp-tln.wikipcin.com (Fall 2006).
3 Harmonized Biosurveillance Use Case Version 1.4, http://www.hln.gov/healthit/documents/BiosurveillanceUseCase.pdf (June 2006).
4 Harmonized EHR-Lab Use Case Version 1.4, http://www.hln.gov/healthit/documents/EHRLabUseCase.pdf (June 2006).
5 Harmonized Consumer Empowerment-Registration and Medication Use Case Version 1.4, http://www.hln.gov/healthit/documents/ConsumerEmpowerTogEhdUseCase.pdf (June 2006).
6 Report on the Functional Requirements Needed for the Initial Definition of a Nationwide Health Information Network, http://www.ncvhs.hln.gov/061010lt.pdf (October 2006)

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Northrop Grumman
Nationwide Health Information Network Architecture Framework

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Features of Our Demonstration

- Physicians use their clinical systems to access NHIN, rather than NHIN portals.
- Consumers use a model PHR application to access NHIN services.
- Consumers control exchange of their health information using a Permissions Registry.
- NHIN hides the complexity of the network to simplify the user experience and thereby foster adoption.
- NHIN translates information in flight to facilitate connection and lower barriers for participation.
- NHIN provides added value by providing access to national data sources, such as RxHub, DoD and VA records, etc.
- NHIN provides added value by automating reporting and routing to other entities, such as the CDC.
- How NHIN can make physicians more productive, consumers more engaged, and public health more informed.

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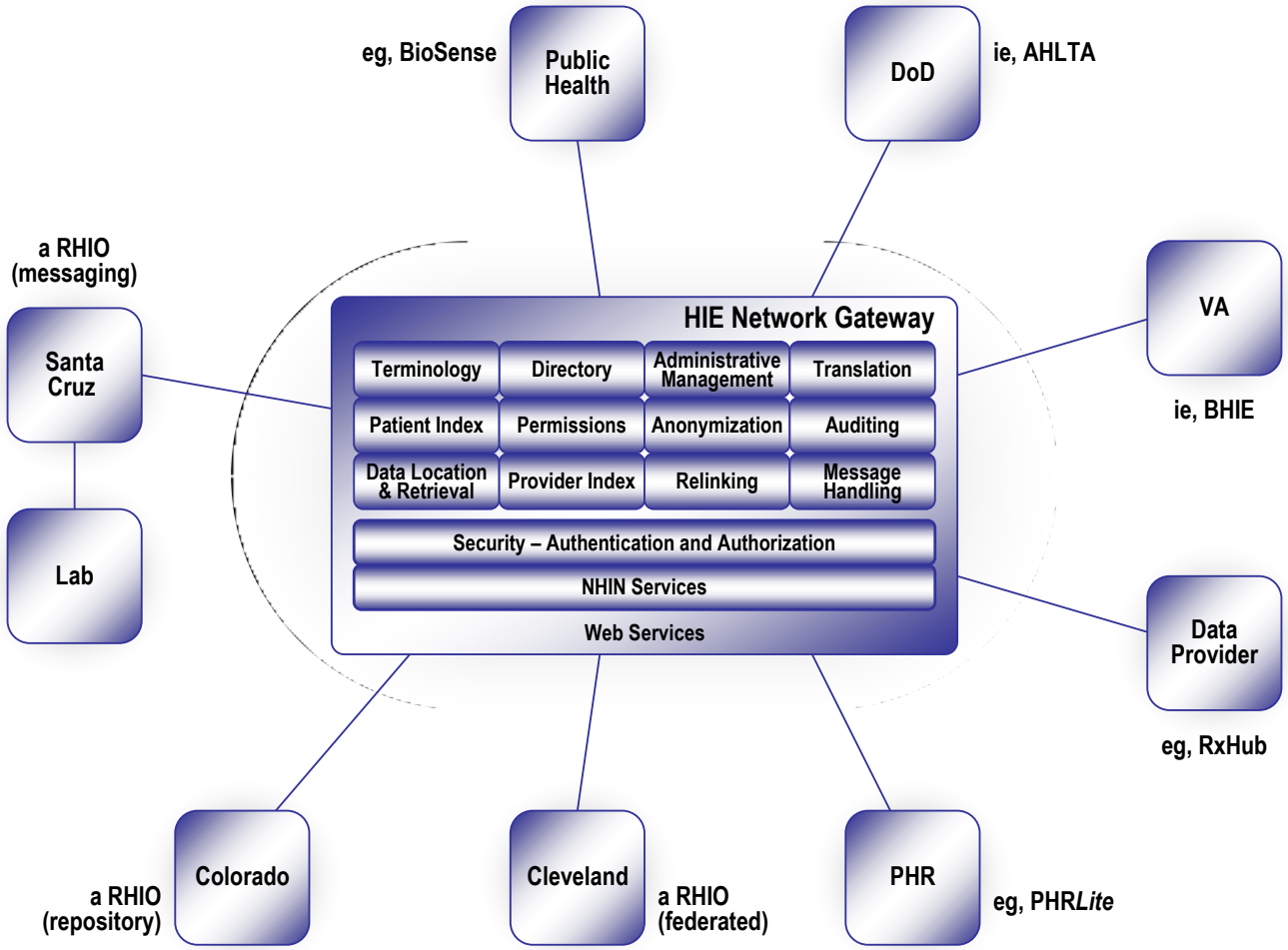
Demonstration Configuration



NHIN Forum Demonstration

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Super-peer Topology

- Similar to hierarchical, but hierarchy stops one level below the master nationwide service
- Highest level of the hierarchy is composed of a number of "super-peers"
- For patient ID example:
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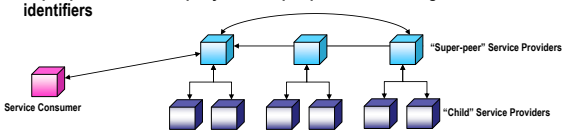

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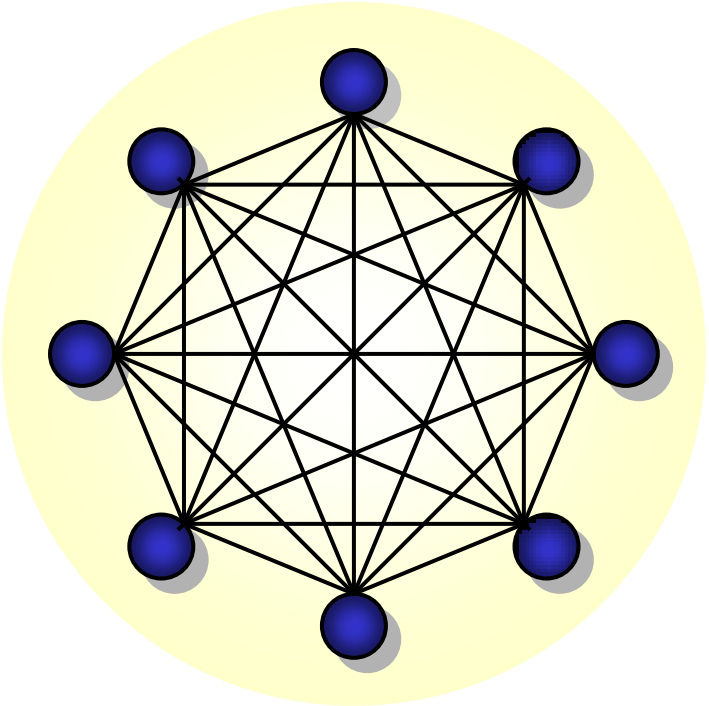
Demonstration of NHIN Services

Compared to Connecting for Health

Does not require all participants to be fully NHIN-capable …

- … but degenerates to the Connecting-for-Health model if all HIEs are NHIN-capable; and
- … enables HIEs to participate while their capabilities grow.



Compared to IHE-based Model

Does not enforce a document model or registry architecture for exchange that might conflict with privacy policies …

- … but supports IHE as an interface for those HIEs that expose it; and
- … supports more flexible models for exchange that can accommodate policy.

Compared to Normalization

Does not require all participants to use the same format and terminology for information to participate …

- … but provides translation services for data in flight;
- … incorporates efficiency of a Canonical Data Model, and
- … allows HIEs to migrate to standards as they continue to develop.

But which one?

Summary

Flexible Model that allows HIE participation while adapting to policies and capabilities of each HIE.

Provides a simple, natural model for a State-wide HIE as a member of NHIN.

Designed to be Easy to Use for the physician by incorporating NHIN seamlessly into their current applications and workflow while hiding the complexity of the network.

Designed for Scalability using a hybrid architecture that is distributed and scalable.

Architecture and service model Consistent with ONC vision for NHIN as documented in Gartner Report.

Questions?

Contact Information

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